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Technical Note

Personal and psychosocial variables in workers with a previous history of LBP: 16-month follow-up

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A 16-month longitudinal study was made of workers who perform physically demanding jobs. In a previous study some of these workers were found to have a history of low back disorders sufficient to miss work, and others not. All were asymptomatic at that time. To further quantify the association between various personal and psychosocial parameters that linger due to a history of low back disorders and how they may change after another 16 months of work. Originally, 72 workers were recruited from heavy industry; 26 of whom had a history of disabling low back disorders sufficient to miss work. In the follow-up study, 46 responded all of whom remained at work injury free, 13 belonged to the 'history of back disorders' category. While the earlier study suggested that having a history of low back disorders is associated with a larger waist girth, a greater chronicity potential as predicted from psychosocial questionnaires, perturbed flexion to extension strength and endurance ratios, and widespread motor control deficits across a variety of tasks some of which resulted in high back loads, the follow-up showed no difference in reported physical symptoms, or perceived pain over the 16 months. Both groups changed their responses from the original data collection to the 16-month follow-up with the net result of psychosocial distinguishing traits, in those with a history, diminishing. It was concluded that time and work appear to be healing.

Keywords: Low back; Injury, pain; Lumbar, work intolerance; Ergonomics; Prevention

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1. Introduction

Several groups have concluded that having a previous history of LBP (low back pain) best predicts future episodes (e.g., Bigos *et al*. 1991), but the links between LBP, and associated changes leading to chronicity, or at least repeating acute episodes, are not fully understood. A previous study (McGill *et al*. 2003) suggested that there are several deficits that linger in workers long after a disabling episode of back trouble even though they may be currently symptom free. These include both physiological and biomechanical traits together with some psychosocial traits. Furthermore, how previously back injured workers recover from the perspective of personal and psychosocial traits is not well known. This longitudinal study was an attempt to document how workers may change following a period of work.

The purpose of this study was to assess various personal and psychosocial parameters associated with having a history of low back troubles sufficient to cause work-loss and how these may change with 16 months of work. Since the original study was a cross-sectional design, the special focus was on those changes which linger long after the original episode. The longitudinal follow-up will indicate how the differences between groups may change with more time.

2. Methods

Since this paper reports data obtained from a longitudinal follow-up where the original study was of a cross-sectional design, the original study will also be briefly described.

2.1. *Original data collection*

Seventy-two workers were recruited from two heavy industries. They performed physically demanding work associated with either electrical utility lines distribution (climbing poles, removing trees, etc.) or metal fabrication (manually handling car wheels and bumpers). Twenty-six had lost time at work due to low back disorders, 22 had reported back disorders but not sufficient to stay off work, and 24 had no history of back disorders. Two of the latter workers were women. All workers were asymptomatic at the time of testing and provided informed consent approved by the University office of Human Research. Extensive questionnaires collecting demographic information, physical demands at work, job satisfaction and personal control, work organization, perceived fitness and chronicity potential, were completed and followed with approximately 4 h of lab testing. Since the lab-based variables were not re-assessed, they will not be described here.

2.2. *Follow-up data collection*

The original questionnaire surveiling the personal, psychosocial variables was mailed once again to all study participants approximately 16 months following the original test.

While many variables were physically tested in the original assessment only, the variables obtained by the questionnaire were retested and reported here. Specifically, the psychosocial variables were the Job Content Questionnaire (Karasek 1994), Personal Control at Work (Greenberger 1982), Workplace Organization (Hunt *et al*. 1993) together with some others to obtain fitness perception parameters, previous history of low back and other musculoskeletal disorders, physical demands of the job (UW-GM study

(Norman *et al*. 1998) etc. For the reader interested in the specifics of these tools, including their validation, they are referred to the original sources. Specific metrics included: Skill Discretion, Decision Authority, Psychological Demands, Physical Exertion, Supervisor Support, Coworker Support, Social Support, Job Insecurity, Job Dissatisfaction, Personal Control, Perceived Physical Fitness and Workplace Organization. The New Zealand Chronicity Score (National Health Committee 1997) was not reassessed since it depends on current adverse symptoms—most participants did not have these in the follow-up. Decision Latitude and Social Support were scales produced by combining several sub-scales; for some data analysis procedures the combination scales were omitted. This allowed a more detailed examination of psychosocial aspects as well as the prevention of dual weighting/examination of the same questionnaire components.

2.3. *Data processing and analysis*

Three major issues were assessed. A one-way ANOVA compared those with a history to those without for differences when responding to the follow-up questionnaire only. When comparing how each group changed their responses over the 16 month follow-up period, a one-way ANOVA was employed together with a correlation determination to assess further predictive value. More detailed insight was obtained into how the groups may have changed their scores, together with any interactions, over the 16 month follow-up by using a repeated measures ANOVA and general linear model.

3. Results

Over the 16-month period, no worker changed low back injury status groups—i.e., no previously uninjured worker sustained an injury. Out of the original 72 workers, 46 responded, 13 of which belonged to the original HIST group, eight belonged to the NO HIST group. (Note: the remainder belonged in the third category of having back troubles but not sufficient to miss work—they were not included in this follow up study.) The 26 missing responses were followed up with the employers who confirmed that the workers had left the company presumably to another job (but current employment status was unconfirmed). However, further analysis (ANOVA) for traits that would distinguish the 'responders' from the 'non-responders' revealed that of all traits characterized, and of all questions asked, only a few were different between the responders and the non-responders. Specifically, one question of Karasek's Job Content Questionnaire (My job requires me to think about a lot of things) was different with the responders tending to agree more than showing ambivalence. Also the responders were different on four out of a total of 11 questions comprising Greenberger's Personal Control at Work inventory (the responders indicated slightly less control with a change of 0.6 out of a possible 5.0). There was no difference between the responders and non-responders for age, stature, weight, BMI, smoking status, job security, physical effort required on the job, supervisor reports, fellow worker support, job satisfaction, or safety and management issues. One could reasonably conclude that the reason for the non-responders leaving the company was not linked to the vast majority of the variables assessed in this study.

3.1. *Initial characterization of workers*

In the original data collection, the following characterizations were observed. There were few significant differences in the physical variables between those with a history and 'no

history' subjects although those with a history of troubles were older (41(6) vs. 31.6(8) years), heavier (89(11) vs. 82.3(13.6) kg) and had a larger waist girth (94.8(7.5) vs. 89.3(9.6) cm). However, when age was used to convert the girth measures into a risk factor, in other words when girth was adjusted for age, the difference between the groups was reduced to a significance level of 0.087 (i.e. above 0.05). In terms of psychosocial factors, those with a history of disabling troubles were significantly differentiated by only three variables. They were found to perceive themselves as having greater skill discretion within their jobs ($p = 0.002$). This, along with a similar, but non-significant finding of greater workplace decision authority, contributed to a significant finding of greater decision latitude for the injured workers ($p = 0.014$). Conversely, the injured were also found to be at a greater risk for chronicity as determined by the modified New Zealand Scale ($p = 0.048$).

All remaining psychosocial variables were not found to be significantly different between the previously-injured and non-injured groups. Notable among the non-significant variables were supervisor support, job security, and job dissatisfaction (McGill *et al*. 2003). Both groups were equally satisfied with their jobs.

There were many biomechanical and motor control characteristics that were different between groups, although these were not retested in the follow-up study. The notable characteristics included: less torso muscle endurance in those with a history, together with a lower willingness to stress low back passive tissues and poorer ability to balance on labile surfaces—to name a few.

3.2. *Description of differences between groups after 16-months elapsed—the follow-up*

While three major differences existed between the HIST and NO HIST groups in the original study, only skill discretion remained different in the 16-month follow-up. Also, notable is the lack of a difference in supervisor support, job security and job satisfaction. All of these variables are the complex sum of questionnaire responses described earlier. Responses to specific questions that differed between the HIST and NO HIST groups revealed that the HIST group were less agreeable to questions such as 'my job requires me to learn new things', 'I am free from conflicting demands that others make' but have more influence over decision diverting work of others and influence over their own job (see table 1). (Note that the scoring was a 5 point scale—codes are noted in the table).

Table 1. Differences between groups (those with a history with work loss vs. those with no history) in the follow-up questionnaire scores only. Mean (standard deviation) scores together with significance level.

Question and Code	HIST	NO HIST	Sig.
1 = strongly agree; 5 = strongly disagree			
My job requires that I learn new things.	1.77 (0.44)	1.25 (0.46)	0.018
My job requires me to do things over and over again.	2 (0.41)	1.5 (0.53)	0.025
I am free from conflicting demands that others make.	4.08 (0.64)	3 (0.93)	0.005
How much influence do you have over the decisions concerning which individuals of your work unit do which tasks?	2.92 (1.38)	1.88 (0.99)	0.078
Question and Code			
1 = very little; 5 = very much			
How much influence do you feel you have over decisions concerning the future of your job?	1.85 (0.69)	1.25 (0.44)	0.024

3.3. *Did groups change their responses over the 16-month period?*

Those with a history (HIST) demonstrated more changes in responses over the 16 months (table 2). Specifically, less creativity and concentration was required, they had less time to get the job done, and were less free from conflicting demands that others make. Assessment of the complex factors revealed that the HIST group had less psychological demand over 16 months, but a higher job control score. In contrast, the NO HIST group demonstrated change in only two questions over the 16 months—less ability of their supervisors to get people to work together and more influence over the quality of the work they did. There were no changes in the complex variables.

3.4. *Differences between groups in how they changed their responses over the 16 months*

While both the HIST and NO HIST groups changed some responses over the 16 months, they differed in how they changed their responses on five questions, but not on any of the complex scores (see table 3). There were no strong tendencies for interpretation.

4. Discussion

This repeated measures longitudinal study of currently active workers was potentially useful for documenting any lingering sequellae resulting from a history of low back

Table 2. How the two groups changed their responses over the 16 months—what changed between initial and follow-up. A comparison of workers who responded to both the initial, and the follow-up questionnaires.

	Initial score	16-month follow-up	Sig.	Correlation	Sig.
Those with history (HIST)					
Simple Questions [1 = strongly agree; 5 = strongly disagree]					
My job requires me to be creative.	1.62 (0.77)	2 (0.82)	0.018	0.797	0.001
My job requires a lot of concentration.	1.54 (0.66)	1.92 (0.49)	0.018	0.649	0.016
I have enough time to get my job done.	1.85 (0.55)	2.46 (0.66)	0.014	0.210	0.491
I am free from conflicting demands that others make.	3.08 (0.86)	4.08 (0.64)	0.002	0.29	0.336
Complex Scores: Psychological Demand [small score = less demand]	33.86 (1.82)	31.38 (1.9)	0.004	0.067	0.828
How much influence do you have over the decisions concerning which individual in your work unit do which tasks? [1 = very little; 5 = very much]	2.31 (1.11)	2.92 (1.38)	0.071	0.615	0.025
Work Control Score	28 (5.1)	30.7 (5.8)	0.37	0.724	0.005
NO HIST					
My supervisor is successful in getting people to work together. [1 = strongly agree; 5 = strongly disagree]	1.88 (0.64)	2.88 (0.83)	0.007	0.501	0.206
How much influence do you have over the quality of the work you do? [1 = very little; 5 = very much]	3 (1.2)	4.13 (0.64)	0.038	0.187	0.658

Table 3. Examining the change in response over time between the (HIST) group and the (NO HIST) group. Only those questions where the two groups changed their responses differently are listed.

Question	Sig.	Interpretation/Comment
History (HIST) vs. No previous history (NO HIST)		
My job requires that I learn new things.	0.028	HIST tended to not learn new things while NO HIST tended towards the need to learn new things
My job requires me to be creative.	0.057	HIST shifted toward not needing to be as creative while NO HIST shifted towards needing to be more creative
My supervisor is successful in getting people to work together.	0.031	Both groups changed—with some people agreeing more or others disagreeing more
How much influence do you have over the quality of work that you do?	0.034	Those with NO HIST felt they had less influence while the HIST group had balanced change (some up and others down)

disorders that were sufficient to cause previous absence and work intolerance and how these lingering sequellae may change with another 16 months of work. There were no reported injuries or lost time in either the HIST or NO HIST groups over the 16-month follow-up. In those with a history of low back disorders, the mean length of time from the last disabling episode (prior to the 16-month follow-up) was substantial—(261 weeks (SD 275) which resulted in a mean of 7 days (SD 10) from work). On balance, it appears that subtle differences still exist between the groups but major—complex variables that would be considered to be more biologically and statistically robust suggest that the overall differences are diminishing. This may motivate some to suggest that work and time are 'healing'. Teasell (1997) has argued quite convincingly that while psychological factors have been cited as being causative of pain and disability, in fact psychological difficulties arise as the consequence of chronic pain (Radanov 1994, Gatchel *et al*. 1995) and disappear upon its resolution (Wallis *et al*. 1977). This notion appears to be consistent with the interpretation obtained from one previous study data when merged with the 16-month follow-up scores.

A limitation for interpreting the data of this study is the low number of subjects who responded in the longitudinal portion of the study. In addition, the ANOVA involving the large number of questions asked risked significant results in a few by chance alone. However, the opposite happened with fewer differences in those with a history of back troubles after the 16 month re-test period suggesting that this was not a concern. As noted earlier, an analysis (ANOVA) for traits that would distinguish the 'responders' from the 'non-responders' revealed that there was little difference between them save for the four questions on personal job control—their reason for leaving the company was not linked to the vast majority of variables assessed in this study. Thus, the strength of the study lies in the many variables documented, and in the similarity of physical job demands—all performed physical work in the plant or in outside hydro lines work. Finally, one may expect that workers would naturally regain health over time. Interestingly some are awarded lifetime compensation for troubled backs. While there is no question that back troubles can last for years, lifetime disability appears to be rare (Weber 1983).

In summary, numerous psychosocial and personal variables were examined for their association with a history of low back troubles sufficient to miss work together with how these variables may change after another 16 months of work. There is no question that some distinguishing traits have lingered, in some cases, long after the last disabling episode were identified. But it appears that these slowly reduce with time. Time and work appear to heal.

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